I. *Experiments and Observations on* Bulbous Roots, Plants, *and* Seeds *growing in* Water. *by Mr.* William Curteis.

ABout three Years since, seeing some *Bulbous Roots* set in Glasses filled with Water in a Shop Window, and being told they would Flower in that manner, I immediately tried a couple of *Hyacinths*, which blowed very prettily the next Spring: it pleased me much to see that we could have such Things in a close Room in Town, without the help of a Garden to produce them, having lately come out of the Country, and being a Lover of Flowers; wherefore I began to think if I could contrive a Method to make a Pot full blow together, with a mixture of several sorts of Flowers with a variety of Colours, it would be an Improvement.

The next Year, I took a couple of common penny Garden Pots, and stopt the Holes at the Bottoms with Corks; and painted the Pots, and puttyed the Corks, that no Water could filtrate through them; then had a couple of Boards cut to fit the tops of the Pots, bored with seven holes at equal Distances, to place my Bulbs in, and likewise as many small holes for placing of Sticks, to tye the Stems of the Flowers to; I then planted *Hyacinths*, *Narcissus's*, *Tulips* and *Junquils*, and filled the Pots with Water up to the Board, so that the Bulbs stood only upon the Water; where they blowed very well, and made the best Appearance, as I thought, I had ever seen, beyond any Flower-pot that could be dressed by gather'd Flowers.

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After the Bloom was over, their Leaves looking green, I ſet them out in my little Garden, thinking any thing that looked green and made a tolerable Figure, agreeable in a *London* Garden; and not depending on the Bulbs again to be of any ſervice to be preſerved, I let them ſtand till toward Midſummer, and took no farther care, but now and then giving them freſh Water as it perſpired or evaporated, and when the Rains fill'd the Pots, I emptied them down to the Boards again; but the Bulbs ſhrinking, ſome of them ſlip'd through the Holes down to the Bottom of the Pot, and about Midſummer, when their Leaves began to grow Yellow, I went with a Deſign to pull them up and throw them away, I was ſurpriſed to find that the Bulbs which were buried in the Water were grown firm, and too large to be drawn back through the Holes, being found and fit for blowing the next Year, and increaſed in Off-ſets.

This occaſion'd me the next Year (which was the laſt) to try another Experiment of blowing my Bulbs under Water, which I found anſwer'd beyond what could be expected, for they rather out-do thoſe that grow in the Ground, in the ſtrength of their Stalks, the clearneſs of their Bloſſoms, the laſting of their Bloom, and likewiſe, the Difference of their Seaſons, which may be ſo manag'd, according to the warmth of the Rooms they are kept in, as to have the ſame Sorts in flower from *Chriſtmas*, till the natural Time of their Bloom in the open Ground, which is *March* and *April*.

But finding it very troubleſome to keep the Boards fix'd under Water, I thought Lead might anſwer the Purpoſe better; whereupon, I got ſome ſheet Lead,

of

of about four pounds to the Foot, cut fit to my Pot, and made holes in it proportionable to the bottoms of my Bulbs, and likewiſe ſmall holes to fix ſticks for the ſupport of the Leaves and Stems of the Flowers; I put a little coarſe Sand in the bottoms of my Pots, thinking it would ſupport the Sticks, and keep them ſteady; but when I came to make uſe of the Sticks, the Sand gave way; I then made falſe bottoms with Lead, and cut Holes oppoſite to thoſe at the Top, which anſwer'd my purpoſe. Upon taking up the Bulbs to put in theſe falſe bottoms, I found the Sand had corroded the Fibres, and changed them all like Ironmould, that I thought they were ſpoil'd; but rincing them in two or three Waters, it came clear off, and on fixing my falſe Bottoms, and placing the Bulbs in their holes, and filling them up with freſh Water, they recover'd, and never changed again in the clear Water, but thriv'd and put forth their Flowers very kindly, although by the Experiments which I had tried, before I could fix them right, I had often planted and tranſplanted them. But I found afterwards that Glaſs Jarrs of the Form as repreſented in the Plate, were the moſt convenient, both for ſeeing the Progreſs the Roots made, and for knowing when they want to be cleaned.

At Fig. I. is repreſented one of theſe Glaſs Jarrs, containing the following Flowers.

1. Golden Sun,
2. Boſſelman, } *Narciſſus's.*
3. Keyſers Jewel,
4. Pulchra, } *Hyacinths.*
5. Janus,

At Fig. II. is repreſented the Profile or Section of the ſame Jarr.

a. The Sticks to tie up the Leaves and Stems of the Flowers.

b. The upper Lead with Holes to ſupport the *Bulbs* and Sticks.

c. The under Lead with Holes to keep the Sticks ſteady.

By ſeveral Experiments on dried Bulbs, and thoſe that were taken freſh out of the Ground, I find the dried ones do beſt; for thoſe taken growing out of the Ground, being full of moiſture, will not ſo ſoon upon changing their Element, be acquainted with a new one; the Fibres they had ſtruck in the Ground, always rot, and they muſt make new ones in the Water, which makes them require a long Time before they can recover themſelves enough to flower. The Bulbs will not rot, yet they will not be ſo ſtrong as thoſe put into the Water when dry, which fill themſelves with moiſture by degrees: Therefore, when I plant my Bulbs, I ſet them at firſt on the top of the Water; for I found by two or three Experiments, that thoſe planted under Water did not puſh out their Fibres ſo ſoon, nor ſo ſtrong, as thoſe ſet upon the Water; the Reaſon of which I take to be, that they were fill'd with Water too ſoon, whereas thoſe ſet upon Water attracted it by degrees, and ſo made both the Fibres and the Bulbs grow ſtronger; and then about five or ſix Weeks after planting them, as the Fibres puſh out, I by degrees fill the Water higher and higher, till the whole Bulb is cover'd,

and

and ſo keep them till the Bloom is over, and the Seaſon for drying them returns.

One Obſervation ſurpriſed me, *viz.* two of my *Hyacinths* were mouldy, which Mould canker'd and eat holes through ſeveral of their Coats or Scales; this I pick'd and clean'd ſeveral times, but ſtill it ſpread farther and farther; but ſoon after they were covered with Water, I could perceive them heal by degrees, till they became perfectly ſound and blew their Flowers as kindly, as thoſe that had continued perfectly ſound.

By another Experiment, I tried what Bulbs would do if kept all the Year under Water: I left in water a *Narciſſus*, an *Hyacinth* of *Peru*, and ſeveral *Junquils*, that were planted in *October*, 1732; which are now as ſound and ſtrong, as thoſe I took out and dried, and promiſe fair for a Bloom; I obſerv'd that their old Fibres do not rot, till they are ready to puſh out new ones.

Another Obſervation ſeems worthy of Notice; one of my double *Hyacinths*, commonly called *Keyſers Jewel*, brought two Pods of Seed to maturity; which I have blowed for fourteen or fifteen Years ſucceſſively in the Ground, and could never find them make any thing towards ſeeding; and I have reaſon to think that ſeveral other Bulbs would have ſeeded, if I had taken timely care of them, but did not perceive it till too late.

Mr. *Miller*, in *Philoſ. Tranſ.* N°. 418. intimates that Bulbs ſet in Glaſſes grow weaker, and ſhould be renewed every Year with freſh ones; but I obſerve by this way of raiſing them under Water, that at their taking up, they are as large, and ſome of them

them ſtronger than when they were planted, and if they be dried at the proper Seaſon, will produce a ſecond Year as well as freſh ones.

I planted likewiſe *Ranunculos* and *Anemone Roots*, which grew and ſhot up the Stems of their Flowers very ſtrong, but the Buds of the Flowers were blaſted, which I am apt to think happened from their being crowded too much, having no convenience to give them free Air enough.

I alſo planted *Auriculas* and *Pinks*, the *Pinks* flowered, but the *Auriculas* were not ſtrong enough; they are ſtill both of them growing, and I am in expectation they will blow the next Seaſon.

I have tried alſo ſeveral Shrubs, as *Roſes*, *Jaſmines*, and *Honyſuckles*; which all grew, and ſtruck out freſh Fibres, and the *Roſe-tree* made ſix ſtrong Buds for Bloſſoms, but accidently ſetting them out in a hot Sun-ſhiny day in *April*, they were all ſcorch'd up, that they came to nothing; I obſerv'd, that ſtrong Suckers cut off two or three Inches under ground, without any Fibres, grew the beſt.

By another Experiment, I was willing to try what the Succulent Plants would do in this way; I took a Leaf of the *Opuntia* or *Indian Fig*, and laid it by to dry for three Weeks or a Month, till it had loſt all its moiſture, and was nothing but a dryed Skin; I then planted it in Water in the beginning of *July*, and tied it to a Stick that was fixed in one of my Leads, and filled the Pot ſo, that the Bottom of the Leaf was a quarter of an Inch in the Water; in about a Month's time the Leaf fill'd, ſtruck out Fibres, and put forth a freſh Leaf, which is now growing, and has made as much progreſs as ſuch a

Plant

Plant would do in the Earth, in the ſame ſpace of Time: I had no opportunity of trying other Succulent Plants.

Dr. *Mortimer* told me he had placed Beans upon Water, which bloſſomed and podded: This put me upon trying the Experiment with them, and likewiſe Peaſe at the ſame Time. I planted ſix Beans in a Pot, and fixed ſticks in it to ſupport their Stems as they grew; they bloom'd as freely as thoſe which are planted in the Ground, but did not pod ſo well, having not above a pod or two on each Plant, which came to perfection, and ripened their Seed; but this might happen for want of a little more Experience; the Peaſe which were of the Dwarf ſort, drew a little too much, and only put out three or four Bloſſoms at the extremity of their Tops, but every Bloſſom brought a Peaſe-cod, and ripened its Seed.

This growth of the Beans and Peaſe, made me imagine that other Seeds would ſucceed in the ſame manner, knowing they would chip upon being laid for a little time in Water, or in a moiſt Place: The only Difficulty was to invent ſomething proper for their ſupport in growing. The firſt Thing I tried was boring very little holes in a piece of Lead, fix'd in a Pot, and ſowing the Seeds thereon; I found they would ſprout, but as the Water evaporated, filling in freſh moved the Seeds from their places, that they could not fix themſelves to turn their Radicle down into the Water; I then tried Towe or Hemp, and ſpread it on the Lead, which I found anſwer the Purpoſe of ſupporting the Seed, which by that means grew, and the Radicle taking hold of the Towe, it was enabled to throw up its Plume or Shoot; I then

tried

tried ſeveral ſorts of ſmall Seeds, and found they would all grow; tho' I made the Experiment about *Chriſtmas*; but I found the Towe diſcoloured the Water, and gave an offenſive ſmell, and that the Seed did not thrive kindly: I then tried Wool and Cotton, the Cotton being too boyant, would not ſo well anſwer the Purpoſe; but Wool, when it is juſt buried in Water, being like a Jelly, and not drying ſo ſoon on the Top, even though the Water has left it, intirely anſwers the Purpoſe as well as ſowing them in the Earth; and if the Seed be good, will keep clean for two or three Months; for this way of ſowing will diſcover whether the Seed be mixed with old Seed (as thoſe bought at a Seed-ſhop generally are.) I ſowed ſeveral ſorts of Sallad-Seeds in this way, and they came to as great perfection as thoſe of the ſame kind raiſed in Hot-beds: and thus they may be produced in any Room or Garret, early in the Spring, and ſo on till late in Autumn, till the cold Weather comes in, and afterwards in the middle of Winter, in a Room where a conſtant Fire is kept. I had ſeveral Sallads laſt Spring, and this Autumn, by ſowing different ſorts every Week one under another, in ſmall half-penny Pots; as *Lettice*, *Creſſes*, *White Muſtard*, *Rape*, and *Raddiſh*, which in a Fortnight after ſowing would be fit to cut; ſo that keeping a proper Succeſſion, I had every Week a tolerable Sallad for two or three Perſons.

My way of ſowing of theſe Seeds, is to have a piece of Lead bored full of holes, and made to fit the Pot, about half an inch below the Top; then filling it with Water, I take a little clean Wool, and ſpread it even and thin, upon the ſurface of the Lead, quite

quite home to the ſides of the Pot, which will then look like a Jelly; if there is too much Water, I pour it off, till the Wool only appears cover'd or fill'd with Water; then I ſow the Seed pretty thick, and in forty-eight Hours it will begin to chip, and in a Fortnight after ſowing will be fit to cut for a Sallad.

I obſerv'd from ſeveral Experiments, that any of theſe Plants tranſplanted out of the Earth into Water would not thrive kindly; but thoſe raiſed in Water may be tranſplanted into Earth, ſo that this Method of raiſing Seeds in Water may be of uſe in a dry Seaſon, to be pricked out into the Earth, though they will not come up in ſuch a Seaſon, if ſowed in the Ground, yet tranſplanted from Water they will take as freely to the Earth as if raiſed in it.

I don't know but from the foregoing Experiments in Water, we may come at a better Way of planting in the Earth, eſpecially ſome Roots, which are apt to rot in the Ground, as *Anemones*, *Ranunculos*, and *Hyacinths*: from an Obſervation I have frequently made, but never before took notice enough to improve it, which is, that I have often ſeen a Bulb drop'd by chance upon the Ground, ſtrike out Fibres ſtronger and more numerous than thoſe planted in their uſual depth of Earth would do. The uſe I would make of this Obſervation, is, that when I plant my Bulbs, I take out the Earth of the Bed, I deſign to plant, as deep as the Bulbs or Roots are to ſtand when planted, and place my Bulbs on the Surface, till the moiſture of the Earth ſhall have attracted their Fibres, and they begin to ſhoot up their Plume, and then by degrees I cover them over to the thickneſs of Mould, that they ſhould ſtand in, by which means they will be in no danger of rotting after they have got ſtrong

Fibres; for when we plant theſe Bulbs or Roots, it is generally either too wet or too dry; if it be a wet Seaſon, the Bulbs are too ſoon ſaturated with Moiſture, which rots them; and if it be too dry, they lie ſo long, before they can attract Moiſture enough to make them Vegetate, that they grow mouldy, and are render'd dry and hard as a piece of Stick, ſo that the firſt Rain infallibly rots them.

N. B. Theſe Experiments were made without the Benefit of any Sun, all my Windows having a *Northern* Expoſition.

As theſe Experiments have open'd a new Scene of Knowledge in the Vegetable World, and may be of great Uſe in Natural Philoſophy, and particularly improve the Art of Gardening; its to be hoped the Curious will carry on the Inquiry as they have Leiſure and Opportunity.

Directions for Planting Bulbous Roots *in Pots or Glaſſes of Water.*

When the Leaden falſe Bottoms are fix'd down tight, within two or three Inches from the Bottom of the Pots (which is only deſign'd to hold the Sticks ſteady that are to ſupport the Leaves and Stems of the Flowers) lay on the Lead, which is to ſupport the Bulbs, placing the notched Part oppoſite to that in the falſe Bottom, as near as the Sticks when placed will ſuffer it; then place your Bulbs in each Hole, and fill in Water up to the Lead, which will then touch the Bottom of the Bulb, and as the Water evapo-

evaporates or perſpires, keep it fill'd to that height, till the Bulbs have ſtruck their Fibres pretty ſtrong into the Water, which may be in a Month or ſix Weeks; then fill in Water about half an Inch above the Lead, and by Degrees as the Fibres ſtrengthen, and the Plume or Head ſprouts, fill it higher and higher till the Bulbs be intirely buried under Water, which muſt be continued till the Seaſon for drying them returns.

But you muſt obſerve at the Planting the Bulbs to clean them very well from any Foulneſs they may have at their Bottoms, by ſcraping them with the Point of a Knife, till the ſound part of the Bulb appears, and likewiſe clear them of all their looſe Skins, and even the brown Skin, till they appear White; which otherwiſe will diſcolour and foul the Water that ſhould be kept as clear as poſſible; and for this Reaſon, the Notches in both the Leads are contriv'd, that upon ſhifting all the Water out of the Pots, if there happens to be any Sediment, by ſhaking the Pots once or twice as it is pour'd off, all the Foulneſs may come with it; but this ſhifting of the Water need not be done but once or twice in a Winter, or when ever you ſee occaſion by the Diſcolouring or Foulneſs of it; and at the ſame Time it will be neceſſary with a Painter's Bruſh to clean off all Slimyneſs that will adhere to the Sides of the Pots and Bulbs, and rince them well, by pouring Water on them at a little Diſtance: By this method they may be kept perfectly clean; and at any time when the outward Skins of the Bulbs looſen and begin to decay, clear them off, which otherwiſe would occaſion Foulneſs; and when ever you ſee Duſt ſwimming on the ſurface

of the Water, fill the Pot full, and let it run over, which will carry it all off, and then pour off the Water to its uſual height.

N. B. Plant Bulbs of equal bigneſs, at leaſt in height, together in the ſame Pot, that they may have the ſame Benefit of the Water; therefore I plant *Narciſſus* and *Hyacinths* and Bulbs of that ſize together; *Tulips* and *Junquils*, &c. by themſelves; and *Crocus* and *Snow-drops*, &c. by themſelves.

Bangor-Court, Shoe-Lane,
Decemb. 19, 1733.

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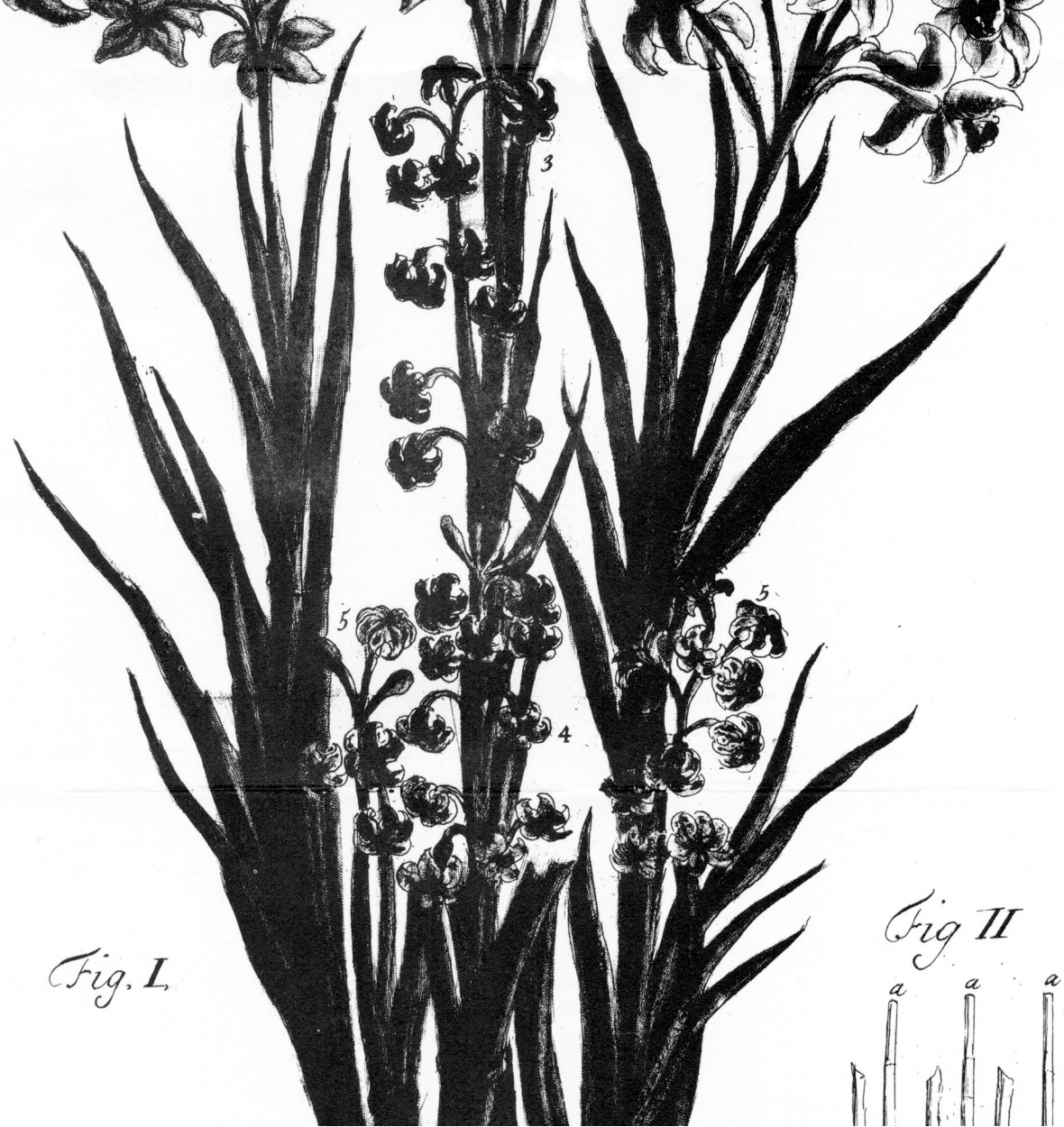

Fig. I.

Fig II

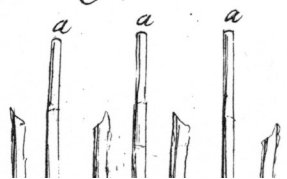

Fig. I.

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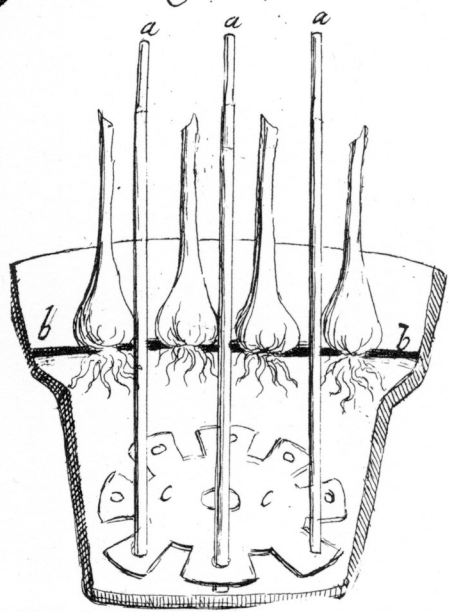
A Scale of Inches.

Fig II



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